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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- March-April 2017
M.Tech IInd Semester

COURSE CODE: 10M11EC213   MAX. MARKS: 25
COURSE NAME: INFORMATION AND CODING THEORY
COURSE CREDITS: 03   MAX. TIME: 1.5 Hrs

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Q1

(i) Consider the following binary sequence 11101001100010110100……. Use the Lempel-Ziv algorithm to encode this sequence. Assume that the binary symbols 0 and 1 are already in the codebook.   **(3 Marks)**

(ii) A voice-grade channel of the telephone network has a bandwidth of 3.4 kHz. Calculate
(a) The information capacity of the telephone channel for a SNR of 30 dB.
(b) The minimum SNR required to support information transmission through the telephone channel at the rate of 9600b/s.   **(2 Marks)**

Q2

(i) Prove that an (n,k) block code must have $d_{min} \leq n-k+1$. Prove that if d_{min} is odd, then all $(d_{min}-1)/2$ error patterns can be corrected.   **(3 Marks)**

(ii) Define and explain a field. Highlight the properties of Galois Field.   **(3 Marks)**

Q3

(i) The parity check matrix for a particular (7,4) linear block code is given by   **(5 Marks)**

$$H = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

(a) Find the generator matrix.
(b) List out all the codewords.
(c) What is the minimum distance between the code vectors?
(d) How many errors can be detected and how many can be corrected?

(ii) How are errors and erasures related in linear block codes?   **(2 Marks)**

Q4

(i) For the (5,1) repetition code G = [1 1 1 1 1], evaluate the syndrome s for the following error patterns   **(4 Marks)**

(a) All five possible single-error patterns
(b) All 10 possible double-error patterns.

(ii) What are Cyclic Codes? Divide x^7+1 by x^3+x+1 over GF(2).   **(3 Marks)**

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